## SEQUENCE LISTING

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<110> Salkoff, Lawrence
     Schreiber, Matthew
     Silvia, Chris
     The Washington University
     ICAgen Inc.
<120> A pH Sensitive Potassium Channel in Spermatocytes
<130> 018512-000120US
<140> 09/176,664
<141> 1998-10-21
<150> US 60/063,138
<151> 1997-10-22
<150> US 60/076,172
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Ų)

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Val Val Leu Lys Arg Ser Glu Lys Ala Lys His Glu Phe Gln Asn His 715 710 705 Ile Val Val Cys Val Phe Gly Asp Ala Gln Cys Thr Leu Val Gly Leu 730 Arg Asn Phe Val Met Pro Leu Arg Ala Ser Asn Tyr Thr Arg Gln Glu Leu Lys Asp Ile Val Phe Ile Gly Ser Leu Glu Tyr Phe Gln Arg Glu 760 Trp Arg Phe Leu Arg Asn Phe Pro Lys Ile His Ile Met Pro Gly Ser 775 Ala Leu Tyr Met Gly Asp Leu Ile Ala Val Asn Val Glu Gln Cys Ser Met Cys Val Ile Leu Ala Thr Pro Tyr Lys Ala Leu Ser Ser Gln Ile 810 Leu Val Asp Thr Glu Ala Ile Met Ala Thr Leu Asn Ile Gln Ser Leu 820 Arg Ile Thr Ser Pro Thr Pro Gly Ser Ser Lys Ser Glu Val Lys Pro Ser Ser Ala Phe Asp Ser Lys Glu Arg Lys Gln Arg Tyr Lys Gln Ile 855 Pro Ile Leu Thr Glu Leu Lys Asn Pro Ser Asn Ile His Phe Ile Glu 870 Gln Met Gly Gly Leu Asp Gly Met Leu Lys Gly Thr Ser Leu His Leu Ser Thr Ser Phe Ser Thr Gly Ala Val Phe Ser Asp Thr Phe Leu Asp 905 Ser Leu Leu Ala Thr Ser Phe Tyr Asn Tyr His Val Val Glu Leu Leu 925 Gln Met Leu Val Thr Gly Gly Ile Ser Ser Glu Met Glu His Tyr Leu Val Lys Glu Lys Pro Tyr Lys Thr Thr Asp Asp Tyr Glu Ala Ile Lys 960 955 Ser Gly Arg Thr Arg Cys Lys Leu Gly Leu Leu Ser Leu Asp Gln Thr Val Leu Ser Gly Ile Asn Pro Arg Lys Thr Phe Gly Gln Leu Phe Cys 985 Gly Ser Leu Asp Asn Phe Gly Ile Leu Cys Val Gly Leu Tyr Arg Met 1000 995 Ile Asp Glu Glu Glu Pro Ser Gln Glu His Lys Arg Phe Val Ile Thr 1020 1015

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Asn Phe Arg Leu Lys Thr Thr Leu Gln Thr Arg Arg Arg His Trp Pro 1060 1065 1070

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Gly Thr Ile Ala Arg Ser His Val Arg Ser Leu His Phe Gln Gly Gln
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Phe Arg Asp His Ile Glu Met Leu Leu Ser Ala Gln Thr Phe Val Gly
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 Gln Val Leu Val Ile Leu Val Phe Val Leu Ser Ile Gly Ser Leu Ile
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              20
 Trp Gln Ile Ile Lys Gly Thr Gly Ile Ile Leu Glu Leu Phe Thr Ser
 Gly Thr Ile Ala Arg Ser His Val Arg Ser Leu His Phe Gln Gly Gln
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<220>

<221> MOD RES

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Gly Thr Ile Ala Arg Ser His Val Arg Ser Leu His Phe Gln Gly Gln

Phe Arg Asp His Ile Glu Met Leu Leu Ser Ala Gln Thr Phe Val Gly 70

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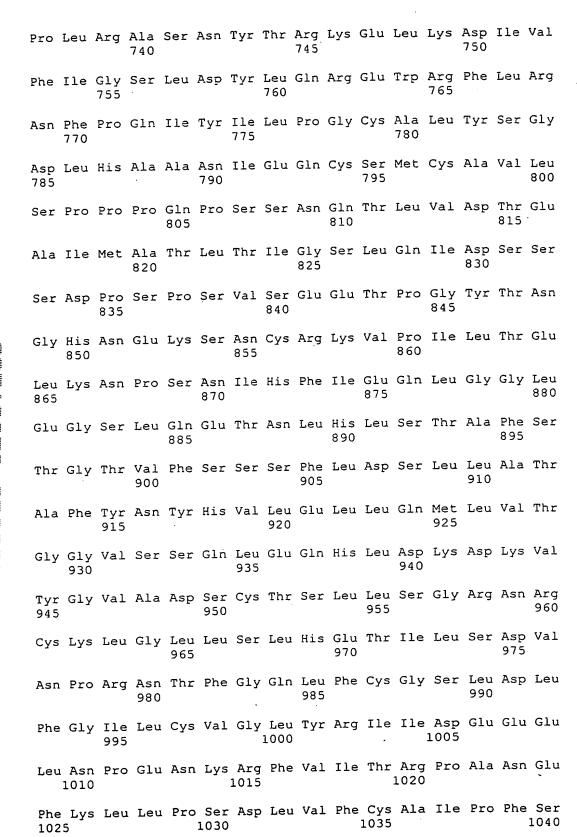
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Leu Glu Leu Phe Thr Ser Gly Thr Ile Ala Arg Ser His Val Arg Ser
                                           75
Leu His Phe Gln Gly Gln Phe Arg Asp His Ile Glu Met Leu Leu Ser
                                       90
                  85
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1050

Thr Ala Cys Tyr Lys Arg Asn Glu Glu Phe Ser Leu Gln Lys Ser Tyr

1045

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Val Thr Phe Phe Ser Gly Leu Ile Ile Leu Leu Ile Phe Arg Leu Ile 35 40 45 .

Trp Arg Ser Val Lys Lys Trp Gln Ile Ile Lys Gly Thr Gly Ile Ile 50 55 60

Leu Glu Leu Phe Thr Ser Gly Thr Ile Ala Arg Ser His Val Arg Ser 65 70 75 80

Leu His Phe Gln Gly Gln Phe Arg Asp His Ile Glu Met Leu Leu Ser 85 90 95

Ala Gln Thr Phe Val Gly Gln Val Leu Val Ile Leu Val Phe Val Leu 100 105 110

Ser Ile Gly Ser Leu Ile Ile Tyr Phe Ile Asn Ser Ala Asp Pro Val 115 120 125

Gly Ser Cys Ser Ser Tyr Glu Asp Lys Thr Ile Pro Ile Asp Leu Val 130 135 140

Phe Asn Ala Phe Phe Ser Phe Tyr Phe Gly Leu Arg Phe Met Ala Ala 145 150 155 160

Asp Asp Lys Ile Lys Phe Trp Leu Glu Met Asn Ser Ile Val Asp Ile 165 170 175

Phe Thr Ile Pro Pro Thr Phe Ile Ser Tyr Tyr Leu Lys Ser Asn Trp 185 180 Leu Gly Leu Arg Phe Leu Arg Ala Leu Arg Leu Leu Glu Leu Pro Gln 200 Ile Leu Gln Ile Leu Arg Ala Ile Lys Thr Ser Asn Ser Val Lys Phe 215 Ser Lys Leu Leu Ser Ile Ile Leu Ser Thr Trp Phe Thr Ala Ala Gly 235 230 Phe Ile His Leu Val Glu Asn Ser Gly Asp Pro Trp Leu Lys Gly Arg Asn Ser Gln Asn Ile Ser Tyr Phe Glu Ser Ile Tyr Leu Val Met Ala 265 Thr Thr Ser Thr Val Gly Phe Gly Asp Val Val Ala Lys Thr Ser Leu 280 Gly Arg Thr Phe Ile Met Phe Phe Thr Leu Gly Ser Leu Ile Leu Phe Ala Asn Tyr Ile Pro Glu Met Val Glu Leu Phe Ala Asn Lys Arg Lys 310 Tyr Thr Ser Ser Tyr Glu Ala Leu Lys Gly Lys Lys Phe Ile Val Val Cys Gly Asn Ile Thr Val Asp Ser Val Thr Ala Phe Leu Arg Asn Phe 345 Leu Arg Asp Lys Ser Gly Glu Ile Asn Thr Glu Ile Val Phe Leu Gly 355 Glu Thr Pro Pro Ser Leu Glu Leu Glu Thr Ile Phe Lys Cys Tyr Leu Ala Tyr Thr Thr Phe Ile Ser Gly Ser Ala Met Lys Trp Glu Asp Leu 390 Arg Arg Val Ala Val Glu Ser Ala Glu Ala Cys Leu Ile Ile Ala Asn 410 Pro Leu Cys Ser Asp Ser His Ala Glu Asp Ile Ser Asn Ile Met Arg 425 Val Leu Ser Ile Lys Asn Tyr Asp Ser Thr Thr Arg Ile Ile Ile Gln Ile Leu Gln Ser His Asn Lys Val Tyr Leu Pro Lys Ile Pro Ser Trp 460 Asn Trp Asp Thr Gly Asp Asn Ile Ile Cys Phe Ala Glu Leu Lys Leu 465 Gly Phe Ile Ala Gln Gly Cys Leu Val Pro Gly Leu Cys Thr Phe Leu 490

Thr Ser Leu Phe Val Glu Gln Asn Lys Lys Val Met Pro Lys Gln Thr 500 Trp Lys Lys His Phe Leu Asn Ser Met Lys Asn Lys Ile Leu Thr Gln 520 Arg Leu Ser Asp Asp Phe Ala Gly Met Ser Phe Pro Glu Val Ala Arg Gly Leu Ile Leu Asn Pro Pro Pro Gln Val Arg Ile Arg Lys Asn Thr 555 Leu Gly Phe Phe Ile Ala Glu Thr Pro Lys Asp Val Arg Arg Ala Leu Phe Tyr Cys Ser Val Cys His Asp Asp Val Phe Ile Pro Glu Leu Ile Thr Asn Cys Gly Cys Lys Ser Arg Ser Arg Gln His Ile Thr Val Pro 600 Ser Val Lys Arg Met Lys Lys Cys Leu Lys Gly Ile Ser Ser Arg İle 615 Ser Gly Gln Asp Ser Pro Pro Arg Val Ser Ala Ser Thr Ser Ser Ile 635 630 Ser Asn Phe Thr Thr Arg Thr Leu Gln His Asp Val Glu Gln Asp Ser 645 Asp Gln Leu Asp Ser Ser Gly Met Phe His Trp Cys Lys Pro Thr Ser 665 Leu Asp Lys Val Thr Leu Lys Arg Thr Gly Lys Ser Lys Tyr Lys Phe Arg Asn His Ile Val Ala Cys Val Phe Gly Asp Ala His Ser Ala Pro Met Gly Leu Arg Asn Phe Val Met Pro Leu Arg Ala Ser Asn Tyr Thr Arg Lys Glu Leu Lys Asp Ile Val Phe Ile Gly Ser Leu Asp Tyr Leu 725 Gln Arg Glu Trp Arg Phe Leu Arg Asn Phe Pro Gln Ile Tyr Ile Leu 745 Pro Gly Cys Ala Leu Tyr Ser Gly Asp Leu His Ala Ala Asn Ile Glu Gln Cys Ser Met Cys Ala Val Leu Ser Pro Pro Pro Gln Pro Ser Ser 775 Asn Gln Thr Leu Val Asp Thr Glu Ala Ile Met Ala Thr Leu Thr Ile 795 785 Gly Ser Leu Gln Ile Asp Ser Ser Ser Asp Pro Ser Pro Ser Val Ser 815 810

Glu Glu Thr Pro Gly Tyr Thr Asn Gly His Asn Glu Lys Ser Asn Cys 820 825 830

Arg Lys Val Pro Ile Leu Thr Glu Leu Lys Asn Pro Ser Asn Ile His 835 840 845

Phe Ile Glu Gln Leu Gly Gly Leu Glu Gly Ser Leu Gln Glu Thr Asn 850 855 860

Leu His Leu Ser Thr Ala Phe Ser Thr Gly Thr Val Phe Ser Ser Ser 865 870 875 880

Phe Leu Asp Ser Leu Leu Ala Thr Ala Phe Tyr Asn Tyr His Val Leu 885 890 895

Glu Leu Leu Gln Met Leu Val Thr Gly Gly Val Ser Ser Gln Leu Glu 900 905 910

Gln His Leu Asp Lys Asp Lys Val Tyr Gly Val Ala Asp Ser Cys Thr 915 920 925

Ser Leu Leu Ser Gly Arg Asn Arg Cys Lys Leu Gly Leu Leu Ser Leu 930 935 940

His Glu Thr Ile Leu Ser Asp Val Asn Pro Arg Asn Thr Phe Gly Gln 945 950 955 960

Leu Phe Cys Gly Ser Leu Asp Leu Phe Gly Ile Leu Cys Val Gly Leu 965 970 975

Tyr Arg Ile Ile Asp Glu Glu Glu Leu Asn Pro Glu Asn Lys Arg Phe 980 985 990

Val Ile Thr Arg Pro Ala Asn Glu Phe Lys Leu Leu Pro Ser Asp Leu 995 1000 1005

Val Phe Cys Ala Ile Pro Phe Ser Thr Ala Cys Tyr Lys Arg Asn Glu 1010 1015 1020

Glu Phe Ser Leu Gln Lys Ser Tyr Glu Ile Val Asn Lys Ala Ser Gln 1025 1030 1035 1040

Thr Thr Glu Asp Thr Phe Arg His Lys Leu Ser Ser His Pro Leu Ile 1045 1050 1055

Gln Leu Leu Arg His Cys Ile His Gln Ser Ile Leu Thr Ser Arg Glu 1060 1065 1070

Leu Thr Pro Ser Leu Phe Leu Ser Lys 1075 1080

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<220>

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Ala Thr Phe Phe Gly Gly Leu Ile Ile Leu Phe Leu Phe Arg Ile Ala 35 40 45

Leu Lys Ser Ser Arg Ser Trp Lys Tyr Val Lys Gly Pro Arg Gly Leu
50 55 60

Leu Glu Leu Phe Ser Ser Arg Arg Ile Glu Ala Asn Pro Leu Arg Lys
65 70 75 80

Leu Tyr Phe His Gly Val Phe Arg Gln Arg Ile Glu Met Leu Leu Ser 85 90 95

Ala Gln Thr Val Val Gly Gln Val Leu Val Ile Leu Val Phe Val Leu 100 105 110

Ser Ile Gly Ser Leu Val Ile Tyr Phe Ile Asn Ser Met Asp Pro Val 115 120 125

Arg Arg Cys Ser Ser Tyr Glu Asp Lys Ile Val His Gly Asp Leu Ser 130 135 140

Phe Asn Ala Phe Phe Ser Phe Tyr Phe Gly Leu Arg Phe Trp Ala Ala 145 150 155 160

Glu Asp Lys Ile Lys Phe Trp Leu Glu Met Asn Ser Ile Val Asp Ile 165 170 175

Phe Thr Ile Pro Pro Thr Phe Ile Ser Tyr Tyr Leu Lys Ser Asn Trp 180 185 190

Leu Gly Leu Arg Phe Leu Arg Ala Leu Arg Leu Leu Glu Leu Pro Lys 195 200 205

Ile Leu Gln Ile Leu Gln Val Ile Lys Thr Ser Asn Ser Val Lys Leu 210 215 220

Ser Lys Leu Leu Ser Ile Val Ile Ser Thr Trp Phe Thr Ala Ala Gly 225 230 235 240

Phe Leu His Leu Val Glu Asn Ser Gly Asp Pro Trp Leu Asn Gly Arg 245 250 255

Asn Ser Gln Thr Met Ser Tyr Phe Glu Ser Ile Tyr Leu Val Thr Ala 260 265 270

Thr Met Ser Thr Val Gly Phe Gly Asp Val Val Ala Lys Thr Ser Leu 280 Gly Arg Ile Phe Ile Val Phe Phe Thr Leu Gly Ser Leu Ile Leu Phe 295 Ala Asn Tyr Ile Pro Glu Met Val Glu Leu Phe Ser Thr Arg Lys Lys 315 310 Tyr Thr Lys Pro Tyr Glu Ala Val Lys Gly Lys Lys Phe Ile Val Val 330 Cys Gly Asn Ile Thr Val Asp Ser Val Thr Ala Phe Leu Arg Asn Phe 340 Leu His Trp Lys Ser Gly Glu Ile Asn Ile Glu Ile Val Phe Leu Gly 360 Glu Thr Leu Pro Cys Leu Glu Leu Glu Thr Leu Leu Lys Cys His Thr Ser Cys Thr Asn Phe Val Cys Gly Thr Ala Leu Lys Phe Glu Asp Leu 395 . Lys Arg Val Ala Val Glu Asn Ser Glu Ala Cys Leu Ile Leu Ala Asn 410 405 His Phe Cys Ser Asp Leu His Asp Glu Asp Asn Ser Asn Ile Met Arg Val Leu Ser Ile Lys Asn Tyr Tyr Pro Gln Thr Arg Val Ile Ile Gln Ile Leu Gln Ser Gln Asn Lys Val Phe Leu Ser Lys Ile Pro Asn Trp 450 Asp Trp Ser Ala Gly Asp Asn Ile Leu Cys Phe Ala Glu Leu Lys Leu Gly Phe Ile Ala Gln Gly Cys Leu Val Pro Gly Leu Cys Thr Phe Leu 485 Thr Thr Leu Phe Ile Glu Gln Asn Gln Lys Val Phe Pro Lys His Pro 505 Trp Gln Lys His Phe Leu Asn Gly Leu Lys Asn Lys Ile Leu Thr Gln Arg Leu Ser Asn Asp Phe Val Gly Met Thr Phe Pro Gln Val Ser Arg Leu Cys Phe Val Lys Leu Asn Leu Met Leu Ile Ala Ile Gln His Lys 555 Pro Phe Phe His Ser Cys Cys Thr Leu Ile Leu Asn Pro Ser Ser Gln Val Arg Leu Asn Lys Asp Thr Leu Gly Phe Phe Ile Ala Asp Ser Ser 585

Lys Ala Val Lys Arg Ala Phe Phe Tyr Cys Ser Asn Cys His Ser Asp 600 Val Cys Asn Pro Glu Leu Ile Gly Lys Cys Asn Cys Lys Ile Lys Ser 615 Arg Gln Gln Leu Ile Ala Pro Thr Ile Met Val Met Lys Ser Ser Leu 630 Thr Asp Phe Thr Thr Ser Ser His Ile His Ala Ser Met Ser Thr Glu 650 Ile His Thr Cys Phe Ser Arg Glu Gln Pro Ser Leu Ile Thr Ile Thr Thr Asn Arg Pro Thr Thr Asn Asp Thr Val Asp Asp Thr Asp Met Leu 680 Asp Ser Ser Gly Met Phe His Trp Cys Arg Ala Met Pro Leu Asp Lys Val Val Leu Lys Arg Ser Glu Lys Ala Lys His Glu Phe Gln Asn His Ile Val Val Cys Val Phe Gly Asp Ala Gln Cys Thr Leu Val Gly Leu 730 Arg Asn Phe Val Met Pro Leu Arg Ala Ser Asn Tyr Thr Arg Gln Glu Leu Lys Asp Ile Val Phe Ile Gly Ser Leu Glu Tyr Phe Gln Arg Glu Trp Arg Phe Leu Arg Asn Phe Pro Lys Ile His Ile Met Pro Gly Ser Ala Leu Tyr Met Gly Asp Leu Ile Ala Val Asn Val Glu Gln Cys Ser 790 Met Cys Val Ile Leu Ala Thr Pro Tyr Lys Ala Leu Ser Ser Gln Ile 805 Leu Val Asp Thr Glu Ala Ile Met Ala Thr Leu Asn Ile Gln Ser Leu 825 Arg Ile Thr Ser Pro Thr Pro Gly Ser Ser Lys Ser Glu Val Lys Pro 840 Ser Ser Ala Phe Asp Ser Lys Glu Arg Lys Gln Arg Tyr Lys Gln Ile 855 Pro Ile Leu Thr Glu Leu Lys Asn Pro Ser Asn Ile His Phe Ile Glu Gln Met Gly Gly Leu Asp Gly Met Leu Lys Gly Thr Ser Leu His Leu 885 Ser Thr Ser Phe Ser Thr Gly Ala Val Phe Ser Asp Thr Phe Leu Asp 905 900

Ser Leu Leu Ala Thr Ser Phe Tyr Asn Tyr His Val Val Glu Leu Leu 915 920 925

Gln Met Leu Val Thr Gly Gly Ile Ser Ser Glu Met Glu His Tyr Leu 930 935 940

Val Lys Glu Lys Pro Tyr Lys Thr Thr Asp Asp Tyr Glu Ala Ile Lys 945 950 955 960

Ser Gly Arg Thr Arg Cys Lys Leu Gly Leu Leu Ser Leu Asp Gln Thr 965 970 975

Val Leu Ser Gly Ile Asn Pro Arg Lys Thr Phe Gly Gln Leu Phe Cys 980 985 990

Gly Ser Leu Asp Asn Phe Gly Ile Leu Cys Val Gly Leu Tyr Arg Met 995 1000 1005

Ile Asp Glu Glu Glu Pro Ser Gln Glu His Lys Arg Phe Val Ile Thr 1010 1015 1020

Arg Pro Ser Asn Glu Cys His Leu Leu Pro Ser Asp Leu Val Phe Cys 1025 1030 1035 1040

Ala Ile Pro Phe Asn Thr Thr Cys Gly Lys Ser Asp Ser Ser Pro Phe 1045 1050 1055

Asn Phe Arg Leu Lys Thr Thr Leu Gln Thr Arg Arg Arg His Trp Pro 1060 1065 1070

Arg Gly Arg Ile Ser Ser Ile Arg Thr Met Pro Thr Ser Pro Thr Ile 1075 1080 1085

Phe Thr Gln Ser Thr Thr Arg Glu Arg Gly Gly Leu Ser Thr Thr 1090 1095 1100

Pro Glu Ser Ile Leu Trp Thr Arg Gln Leu Phe Cys Gly Ser Leu Asp 1105 1110 1115 1120

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<212> PRT

<213> Mus musculus

<220>

<223> mouse Slo1 (mSlo1)

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Arg Gly Gln Arg Met Trp Trp Ala Phe Leu Ala Ser Ser Met Val Thr
20 25 30

Phe Phe Gly Gly Leu Phe Ile Ile Leu Leu Trp Arg Thr Leu Lys Tyr 35 40 45

Leu Trp Thr Val Cys Cys His Cys Gly Gly Lys Thr Lys Glu Ala Gln Lys Ile Asn Asn Gly Ser Ser Gln Ala Asp Gly Thr Leu Lys Pro Val Asp Glu Lys Glu Glu Val Val Ala Ala Glu Val Gly Trp Met Thr Ser Val Lys Asp Trp Ala Gly Val Met Ile Ser Ala Gln Thr Leu Thr Gly 105 Arg Val Leu Val Val Leu Val Phe Ala Leu Ser Ile Gly Ala Leu Val 120 Ile Tyr Phe Ile Asp Ser Ser Asn Pro Ile Glu Ser Cys Gln Asn Phe 135 Tyr Lys Asp Phe Thr Leu Gln Ile Asp Met Ala Phe Asn Val Phe Phe 155 Leu Leu Tyr Phe Gly Leu Arg Phe Ile Ala Ala Asn Asp Lys Leu Trp 165 Phe Trp Leu Glu Val Asn Ser Val Val Asp Phe Phe Thr Val Pro Pro 185 Val Phe Val Ser Val Tyr Leu Asn Arg Ser Trp Leu Gly Leu Arg Phe 200 Leu Arg Ala Leu Arg Leu Ile Gln Phe Ser Glu Ile Leu Gln Phe Leu 215 Asn Ile Leu Lys Thr Ser Asn Ser Ile Lys Leu Val Asn Leu Leu Ser 235 Ile Phe Ile Ser Thr Trp Leu Thr Ala Ala Gly Phe Ile His Leu Val Glu Asn Ser Gly Asp Pro Trp Glu Asn Phe Gln Asn Asn Gln Ala Leu 265 Thr Tyr Trp Glu Cys Val Tyr Leu Leu Met Val Thr Met Ser Thr Val 275 Gly Tyr Gly Asp Val Tyr Ala Lys Thr Thr Leu Gly Arg Leu Phe Met 300 295 Val Phe Phe Ile Leu Gly Gly Leu Ala Met Phe Ala Ser Tyr Val Pro .305Glu Ile Ile Glu Leu Ile Gly Asn Arg Lys Lys Tyr Gly Gly Ser Tyr 330 Ser Ala Val Ser Gly Arg Lys His Ile Val Val Cys Gly His Ile Thr 345 Leu Glu Ser Val Ser Asn Phe Leu Lys Asp Phe Leu His Lys Asp Arg

365

360

Asp Asp Val Asn Val Glu Ile Val Phe Leu His Asn Ile Ser Pro Asn 370 Leu Glu Leu Glu Ala Leu Phe Lys Arg His Phe Thr Gln Val Glu Phe 390 Tyr Gln Gly Ser Val Leu Asn Pro His Asp Leu Ala Arg Val Lys Ile 410 Glu Ser Ala Asp Ala Cys Leu Ile Leu Ala Asn Lys Tyr Cys Ala Asp Pro Asp Ala Glu Asp Ala Ser Asn Ile Met Arg Val Ile Ser Ile Lys 440 Asn Tyr His Pro Lys Ile Arg Ile Ile Thr Gln Met Leu Gln Tyr His 450 Asn Lys Ala His Leu Leu Asn Ile Pro Ser Trp Asn Trp Lys Glu Gly 475 Asp Asp Ala Ile Cys Leu Ala Glu Leu Lys Leu Gly Phe Ile Ala Gln 485 Ser Cys Leu Ala Gln Gly Leu Ser Thr Met Leu Ala Asn Leu Phe Ser 505 Met Arg Ser Phe Ile Lys Ile Glu Glu Asp Thr Trp Gln Lys Tyr Tyr 525 520 Leu Glu Gly Val Ser Asn Glu Met Tyr Thr Glu Tyr Leu Ser Ser Ala 540 Phe Val Gly Leu Ser Phe Pro Thr Val Cys Glu Leu Cys Phe Val Lys 560 Leu Lys Leu Leu Met Ile Ala Ile Glu Tyr Lys Ser Ala Asn Arg Glu Ser Arg Ile Leu Ile Asn Pro Gly Asn His Leu Lys Ile Gln Glu Gly 585 Thr Leu Gly Phe Phe Ile Ala Ser Asp Ala Lys Glu Val Lys Arg Ala 595 Phe Phe Tyr Cys Lys Ala Cys His Asp Asp Val Thr Asp Pro Lys Arg 615 Ile Lys Lys Cys Gly Cys Arg Arg Leu Ile Tyr Phe Glu Asp Glu Gln Pro Pro Thr Leu Ser Pro Lys Lys Gln Arg Asn Gly Gly Met Arg 650 Asn Ser Pro Asn Thr Ser Pro Lys Leu Met Arg His Asp Pro Leu Leu 660 Ile Pro Gly Asn Asp Gln Ile Asp Asn Met Asp Ser Asn Val Lys Lys 680 685 675

Tyr Asp Ser Thr Gly Met Phe His Trp Cys Ala Pro Lys Glu Ile Glu 690 Lys Val Ile Leu Thr Arg Ser Glu Ala Ala Met Thr Val Leu Ser Gly 715 710 His Val Val Cys Ile Phe Gly Asp Val Ser Ser Ala Leu Ile Gly 730 Leu Arg Asn Leu Val Met Pro Leu Arg Ala Ser Asn Phe His Tyr His Glu Leu Lys His Ile Val Phe Val Gly Ser Ile Glu Tyr Leu Lys Arg 760 Glu Trp Glu Thr Leu His Asn Phe Pro Lys Val Ser Ile Leu Pro Gly Thr Pro Leu Ser Arg Ala Asp Leu Arg Ala Val Asn Ile Asn Leu Cys 795 Asp Met Cys Val Ile Leu Ser Ala Asn Gln Asn Asn Ile Asp Asp Thr Ser Leu Gln Asp Lys Glu Cys Ile Leu Ala Ser Leu Asn Ile Lys Ser 825 Met Gln Phe Asp Asp Ser Ile Gly Val Leu Gln Ala Asn Ser Gln Gly Phe Thr Pro Pro Gly Met Asp Arg Ser Ser Pro Asp Asn Ser Pro Val 855 His Gly Met Leu Arg Gln Pro Ser Ile Thr Thr Gly Val Asn Ile Pro 870 Ile Ile Thr Glu Leu Val Asn Asp Thr Asn Val Gln Phe Leu Asp Gln 890 885 Asp Asp Asp Asp Pro Asp Thr Glu Leu Tyr Leu Thr Gln Pro Phe 910 905 Ala Cys Gly Thr Ala Phe Ala Val Ser Val Leu Asp Ser Leu Met Ser 925 Ala Thr Tyr Phe Asn Asp Asn Ile Leu Thr Leu Ile Arg Thr Leu Val 935 Thr Gly Gly Ala Thr Pro Glu Leu Glu Ala Leu Ile Ala Glu Glu Asn 955 945 Ala Leu Arg Gly Gly Tyr Ser Thr Pro Gln Thr Leu Ala Asn Arg Asp 970 Arg Cys Arg Val Ala Gln Leu Ala Leu Leu Asp Gly Pro Phe Ala Asp 980 Leu Gly Asp Gly Gly Cys Tyr Gly Asp Leu Phe Cys Lys Ala Leu Lys 1005 1000

Thr Tyr Asn Met Leu Cys Phe Gly Ile Tyr Arg Leu Arg Asp Ala His 1010

Leu Ser Thr Pro Ser Gln Cys Thr Lys Arg Tyr Val Ile Thr Asn Pro 1035 1030

Pro Tyr Glu Phe Glu Leu Val Pro Thr Asp Leu Ile Phe Cys Leu Met 1050

Gln Phe Asp His Asn Ala Gly Gln Ser Arg Ala Ser Leu Ser His Ser 1060

Ser His Ser Ser Gln Ser Ser Ser Lys Lys Ser Ser Ser Val His Ser 1080

Ile Pro Ser Thr Ala Asn Arg Pro Asn Arg Pro Lys Ser Arg Glu Ser 1100 1095 1090

Arg Asp Lys Gln Asn Ala Thr Arg Met Thr Arg Met Gly Gln Ala Glu 1115 1110

Lys Lys Trp Phe Thr Asp Glu Pro Asp Asn Ala Tyr Pro Arg Asn Ile 1130 1125

Gln Ile Lys Pro Met Ser Thr His Met Ala Asn Gln Ile Asn Gln Tyr 1145 1140

Lys Ser Thr Ser Ser Leu Ile Pro Pro Ile Arg Glu Val Glu Asp Glu 1155

Cys Glu Leu Val Pro Thr Asp Leu Ile Phe Cys Leu Met Gln Phe Asp 1175

His Asn Ala Gly Gln Ser Arg Ala Ser Leu Ser His Ser Ser His Ser 1195 1185 1190

Ser Gln Ser Ser Ser Lys Lys Ser Ser Ser Val His Ser Ile Pro Ser 1210

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Gln Asn Ala Thr 1235

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Pro Thr Asp Ser Pro Phe Asp Ala Asp Asp Cys Leu Lys Val Arg Lys 35 40 45

Tyr Trp Cys Phe Leu Leu Ser Ser Ile Phe Thr Phe Leu Ala Gly Leu 50 55 60

Leu Val Val Leu Leu Trp Arg Ala Phe Ala Phe Val Ser Cys Arg Lys
65 70 75 80

Glu Pro Asp Leu Gly Pro Asn Asp Pro Lys Gln Lys Glu Gln Lys Ala 85 90 95

Ser Arg Asn Lys Gln Glu Phe Glu Gly Thr Phe Met Thr Glu Ala Lys

Asp Trp Ala Gly Glu Leu Ile Ser Gly Gln Thr Thr Thr Gly Arg Ile 115 120 125

Leu Val Val Leu Val Phe Ile Leu Ser Ile Ala Ser Leu Ile Ile Tyr 130 135 140

Phe Val Asp Ala Ser Ser Glu Glu Val Glu Arg Cys Gln Lys Trp Ser 145 150 155 160

Asn Asn Ile Thr Gln Gln Ile Asp Leu Ala Phe Asn Ile Phe Phe Met
165 170 175

Val Tyr Phe Phe Ile Arg Phe Ile Ala Ala Ser Asp Lys Leu Trp Phe 180 185 190

Met Leu Glu Met Tyr Ser Phe Val Asp Tyr Phe Thr Ile Pro Pro Ser 195 200 205

Phe Val Ser Ile Tyr Leu Asp Arg Thr Trp Ile Gly Leu Arg Phe Leu 210 215 220

Arg Ala Leu Arg Leu Met Thr Val Pro Asp Ile Leu Gln Tyr Leu Asn 225 230 235 240

Val Leu Lys Thr Ser Ser Ser Ile Arg Leu Ala Gln Leu Val Ser Ile 245 250 255

Phe Ile Ser Val Trp Leu Thr Ala Ala Gly Ile Ile His Leu Leu Glu 260 265 270

Asn Ser Gly Asp Pro Leu Asp Phe Asn Asn Ala His Arg Leu Ser Tyr
275 280 285

Trp Thr Cys Val Tyr Phe Leu Ile Val Thr Met Ser Thr Val Gly Tyr 290 295 300

Gly Asp Val Tyr Cys Glu Thr Val Leu Gly Arg Thr Phe Leu Val Phe 305 310 315

Phe Leu Leu Val Gly Leu Ala Val Phe Ala Ser Trp Ile Pro Glu Ile 325 330 335

Thr Glu Leu Ala Ala Gln Arg Ser Lys Tyr Gly Gly Thr Tyr Ser Lys 340 345 350

Asp Pro Arg Lys Arg His Ile Val Val Cys Gly His Ile Thr Tyr Glu 365 Ser Val Ser His Phe Leu Lys Asp Phe Leu His Glu Asp Arg Glu Asp 375 Val Asp Val Glu Val Val Phe Leu His Arg Lys Pro Pro Asp Leu Glu 395 Leu Glu Gly Leu Phe Lys Arg His Phe Thr Thr Val Glu Phe Phe Gln 405 Gly Thr Ile Met Asn Pro Ile Asp Leu Gln Arg Val Lys Val His Glu 425 Ala Asp Ala Cys Leu Val Leu Ala Asn Lys Tyr Cys Gln Asp Pro Asp 440 Ala Glu Asp Ala Ala Asn Ile Met Arg Val Ile Ser Ile Lys Asn Tyr 455 Ser Asp Asp Ile Arg Val Ile Ile Gln Leu Met Gln Tyr His Asn Lys 470 Ala Tyr Leu Leu Asn Ile Pro Ser Trp Asp Trp Lys Gln Gly Asp Asp 490 Val Ile Cys Leu Ala Glu Leu Lys Leu Gly Phe Ile Ala Gln Ser Cys 500 Leu Ala Pro Gly Phe Ser Thr Met Met Ala Asn Leu Phe Ala Met Arg 520 Ser Phe Lys Thr Ser Pro Asp Met Gln Ser Trp Thr Asn Asp Tyr Leu 535 Arg Gly Thr Gly Met Glu Met Tyr Thr Glu Thr Leu Ser Pro Thr Phe 555 550 Ile Gly Ile Pro Phe Ala Gln Ala Thr Glu Leu Cys Phe Ser Lys Leu Lys Leu Leu Leu Ala Ile Glu Ile Lys Gly Ala Glu Glu Gly Ala Asp Ser Lys Ile Ser Ile Asn Pro Arg Gly Ala Lys Ile Gln Ala Asn Thr Gln Gly Phe Phe Ile Ala Gln Ser Ala Asp Glu Val Lys Arg Ala 615 610 Trp Phe Tyr Cys Lys Ala Cys His Glu Asp Ile Lys Asp Glu Thr Leu 635 630 Ile Lys Lys Cys Lys Cys Lys Asn Leu Thr Val Gln Pro Arg Ser Lys 645 Phe Asp Asp Leu Gly Asp Ile Thr Arg Asp Arg Glu Asp Thr Asn Leu

665

Leu Asn Arg Asn Val Arg Arg Pro Asn Gly Thr Gly Asn Gly Thr Gly Gly Met His His Met Asn Ser Thr Arg Ala Ala Ala Ala Ala Ala Ala Ala Ala Gly Lys Gln Val Asn Lys Val Lys Pro Thr Val Asn Val Ser Arg Gln Val Glu Gly Gln Val Ile Ser Pro Ser Gln Tyr Asn Arg Pro Thr Ser Arg Ser Ser Gly Thr Gly Thr Gln Asn Gln Asn Gly Gly Val 745 Ser Leu Pro Ala Gly Ile Ala Asp Asp Gln Ser Lys Asp Phe Asp Phe Glu Lys Thr Glu Met Lys Tyr Asp Ser Thr Gly Met Phe His Trp Ser Pro Ala Lys Ser Leu Gln Asp Cys Ile Leu Asp Arg Asn Gln Ala Ala 785 Met Thr Val Leu Asn Gly His Val Val Cys Leu Phe Ala Asp Pro 810 Asp Ser Pro Leu Ile Gly Leu Arg Asn Leu Val Met Pro Leu Arg Ala 820 Ser Asn Phe His Tyr His Glu Leu Lys His Val Val Ile Val Gly Ser 840 Val Asp Tyr Ile Arg Arg Glu Trp Lys Met Leu Gln Asn Leu Pro Lys 855 Ile Ser Val Leu Asn Gly Ser Pro Leu Ser Arg Ala Asp Leu Arg Ala 875 Val Asn Val Asn Leu Cys Asp Met Cys Cys Ile Leu Ser Ala Lys Val 895 890 Pro Ser Asn Asp Asp Pro Thr Leu Ala Asp Lys Glu Ala Ile Leu Ala Ser Leu Asn Ile Lys Ala Met Thr Phe Asp Asp Thr Ile Gly Val Leu Ser Gln Arg Gly Pro Glu Phe Asp Asn Leu Ser Ala Thr Ala Gly Ser 935 930 Pro Ile Val Leu Gln Arg Arg Gly Ser Val Tyr Gly Ala Asn Val Pro 955 950 Met Ile Thr Glu Leu Val Asn Asp Gly Asn Val Gln Phe Leu Asp Gln 965 Asp Asp Asp Asp Pro Asp Thr Glu Leu Tyr Leu Thr Gln Pro Phe

985

Ala Cys Gly Thr Ala Phe Ala Val Ser Val Leu Asp Ser Leu Met Ser 995 1000 1005

Thr Thr Tyr Phe Asn Gln Asn Ala Leu Thr Leu Ile Arg Ser Leu Ile 1010 1015 1020

Thr Gly Gly Ala Thr Pro Glu Leu Glu Leu Ile Leu Ala Glu Gly Ala 1025 1030 1035 1040

Gly Leu Arg Gly Gly Tyr Ser Thr Val Glu Ser Leu Ser Asn Arg Asp 1045 1050 1055

Arg Cys Arg Val Gly Gln Ile Ser Leu Tyr Asp Gly Pro Leu Ala Gln
1060 1065 1070

Phe Gly Glu Cys Gly Lys Tyr Gly Asp Leu Phe Val Ala Ala Leu Lys 1075 1080 .1085

Ser Tyr Gly Met Leu Cys Ile Gly Leu Tyr Arg Phe Arg Asp Thr Ser

Ser Ser Cys Asp Ala Ser Ser Lys Arg Tyr Val Ile Thr Asn Pro Pro 1105 1110 1115 1120

Asp Asp Phe Ser Leu Leu Pro Thr Asp Gln Val Phe Val Leu Met Gln 1125 1130 1135

Phe Asp Pro Gly Leu Glu Tyr Lys Pro Pro Ala Val Arg Ala Pro Ala 1140 1145 1150

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Ser Asn Lys Asp Asp Asn Ser Leu Ser Asn Arg Asp Arg Cys Arg Val 1170 1175 1180

Gly Gln Ile Ser Leu Tyr Asp Gly Pro Leu Ala Gln Phe Gly Glu Cys 1185 1190 1195 1200

Gly Lys Tyr Gly Asp Leu Phe Val Ala Ala Leu Lys Ser Tyr Gly Met 1205 1210 1215

Leu Cys Ile Gly Leu Tyr Arg Phe Arg Asp Thr Ser Ser Ser Cys Asp 1220 1225 1230

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